

10/698,118

(FILE 'HOME' ENTERED AT 16:48:56 ON 27 NOV 2004)

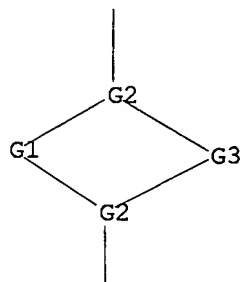
FILE 'REGISTRY' ENTERED AT 16:49:13 ON 27 NOV 2004

L1 STRUCTURE UPLOADED

=> d l1

L1 HAS NO ANSWERS

L1 STR



G1 Ag,Au,Cu

G2 O,S,Se,Te

G3 Al,Ga,In

Structure attributes must be viewed using STN Express query preparation.

=> s l1

SAMPLE SEARCH INITIATED 16:49:33 FILE 'REGISTRY'

SAMPLE SCREEN SEARCH COMPLETED - 55 TO ITERATE

100.0% PROCESSED 55 ITERATIONS

1 ANSWERS

SEARCH TIME: 00.00.01

FULL FILE PROJECTIONS: ONLINE **COMPLETE**

BATCH **COMPLETE**

PROJECTED ITERATIONS: 656 TO 1544

PROJECTED ANSWERS: 1 TO 80

L2 1 SEA SSS SAM L1

=> s l1 full

FULL SEARCH INITIATED 16:49:38 FILE 'REGISTRY'

FULL SCREEN SEARCH COMPLETED - 966 TO ITERATE

100.0% PROCESSED 966 ITERATIONS

38 ANSWERS

SEARCH TIME: 00.00.01

L3 38 SEA SSS FUL L1

=> fil caplus

COST IN U.S. DOLLARS

SINCE FILE

TOTAL

ENTRY

SESSION

FULL ESTIMATED COST

155.42

155.63

FILE 'CAPLUS' ENTERED AT 16:49:43 ON 27 NOV 2004

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FILE COVERS 1907 - 27 Nov 2004 VOL 141 ISS 23
FILE LAST UPDATED: 26 Nov 2004 (20041126/ED)

This file contains CAS Registry Numbers for easy and accurate substance identification.

=> s 13

L4 28 L3

=> d 1-28 bib abs

L4 ANSWER 1 OF 28 CAPLUS COPYRIGHT 2004 ACS on STN
AN 2004:343960 CAPLUS
DN 141:306353
TI Synthesis and characterization of CuInS₂ single source precursors for chemical vapor deposition
AU Cowen, J. E.; Riga, A. T.; Hepp, A. F.; Duraj, S. A.; Banger, K.; McClarnon, R.
CS Cleveland State University, Cleveland, OH, 44115, USA
SO Journal of Thermal Analysis and Calorimetry (2004), 75(3), 929-936
CODEN: JTACF7; ISSN: 1388-6150
PB Kluwer Academic Publishers
DT Journal
LA English
AB A family of single source precursors, for the spray CVD of chalcopyrite thin films (CuInS₂), was synthesized in good yields (.apprx.65%). Newly synthesized compds. include [$\{L\}_2Cu(SR)_2In(SR)_2$] (R = alkyl, aryl; L = phosphine/arsine/stibine neutral donor ligand). The use of the single source precursors provides an attractive alternative over conventionally used multi-source precursors, which are often toxic, air sensitive and pyrophoric. However, it is desirable that these thin films be processed on flexible polymer substrates such as Kapton. Therefore, milder deposition temps. are needed to maintain the structural integrity of the underlying polymer substrates. By selective manipulation of the steric and electronic properties of the precursor, milder processing temps. may be employed, while maintaining the desired stoichiometry of the deposited films. Elucidation of the structures were confirmed using NMR. Thermal anal. techniques, DSC and TGA (TG), were employed to determine thermal profiles of each candidate compound
RE.CNT 7 THERE ARE 7 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 2 OF 28 CAPLUS COPYRIGHT 2004 ACS on STN
AN 2004:277396 CAPLUS
DN 141:192917
TI Synthesis and characterization of the first liquid single source precursors for the deposition of ternary chalcopyrite (CuInS₂) thin film materials
AU Banger, Kulbinder K.; Cowen, Jonathan; Hepp, Aloysius F.

CS Ohio Aerospace Institute, Brook Park, OH, 44142, USA
SO NASA/TM (2002), NASA/TM-2002-211128, 1-42
CODEN: NATMA4; ISSN: 0499-9320

DT Report
LA English

OS CASREACT 141:192917

AB Mol. engineering of ternary single source precursors based on the $[(\text{PBu}_3)_2\text{Cu}(\text{SR}')_2\text{In}(\text{SR}')_2]$ architecture have afforded the 1st liquid CIS ternary single source precursors (when $R = \text{Et}, \text{Pr}$), which are suitable for low temperature deposition, ($< 350^\circ\text{C}$). Thermogravimetric analyses (TGA) and Modulated-DSC confirm their liquid phase and reduced stability. X-ray diffraction studies, EDS and SEM support the formation of the single-phase chalcopyrite CuInS_2 at low temps.

RE.CNT 22 THERE ARE 22 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 3 OF 28 CAPLUS COPYRIGHT 2004 ACS on STN

AN 2004:46634 CAPLUS

DN 140:342013

TI Chemical vapor deposition for ultra-lightweight thin-film solar arrays for space

AU Hepp, Aloysius F.; Raffaelle, Ryne P.; Banger, Kulbinder K.; Jin, Michael H.; Lau, Janice E.; Harris, Jerry D.; Cowen, Jonathan E.; Duraj, Stan A.

CS National Aeronautics and Space Administration, Glenn Research Center, Cleveland, OH, 44135, USA

SO NASA/TM (2002), NASA/TM-2002-2111835, 1-6

CODEN: NATMA4; ISSN: 0499-9320

DT Report

LA English

AB The development of thin-film solar cells on flexible, lightwt., space-qualified substrates provides an attractive cost solution to fabricating solar arrays with high sp. power (W/kg). The use of a polycryst. chalcopyrite absorber layer for thin-film solar cells is considered for the next generation photovoltaic devices. This creates a need for low-cost high-throughput manufacturing of high-efficiency thin-film solar cells. New single-source-precursors (SSP's) and their use in deposition of chalcopyrite semi-conducting layers (CIS) onto flexible substrates for solar cell fabrication are discussed. The syntheses and thermal modulation of SSP's via mol. engineering is described. Thin-film fabrication studies demonstrate that the SSPs can be used in a spray CVD process for depositing CIS at reduced temps., which has good elec. properties suitable for PV devices.

RE.CNT 15 THERE ARE 15 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 4 OF 28 CAPLUS COPYRIGHT 2004 ACS on STN

AN 2003:860654 CAPLUS

DN 140:67846

TI A New Facile Route for the Preparation of Single-Source Precursors for Bulk, Thin-Film, and Nanocrystallite I-III-VI Semiconductors

AU Banger, Kulbinder K.; Jin, Michael H.-C.; Harris, Jerry D.; Fanwick, Philip E.; Hepp, Aloysius F.

CS Ohio Aerospace Institute, Cleveland, OH, 44142, USA

SO Inorganic Chemistry (2003), 42(24), 7713-7715

CODEN: INOCAJ; ISSN: 0020-1669

PB American Chemical Society

DT Journal

LA English

AB The authors report a new simplified synthetic procedure for com. manufacture of ternary single-source precursors (SSPs). This new synthetic process was successfully implemented to fabricate known SSPs on bulk scale and the 1st liquid SSPs to the semiconductors CuInSe_2 and AgInxSy . Single crystal x-ray

determination reveals the 1st unsolvated ternary AgInS SSP. SSPs prepared via this new route have successfully been used in a spray assisted CVD process to deposit polycryst. thin films, and for preparing ternary nanocrystallites.

RE.CNT 16 THERE ARE 16 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 5 OF 28 CAPLUS COPYRIGHT 2004 ACS on STN
AN 2003:822014 CAPLUS
DN 140:50503
TI The effect of film composition on the texture and grain size of CuInS₂ prepared by chemical spray pyrolysis
AU Jin, Michael H.-C.; Banger, Kulbinder K.; Harris, Jerry D.; Hepp, Aloysius F.
CS Ohio Aerospace Institute, Brookpark, OH, 44142, USA
SO Materials Research Society Symposium Proceedings (2003), 763 (Compound Semiconductor Photovoltaics), 403-408
CODEN: MRSPDH; ISSN: 0272-9172
PB Materials Research Society
DT Journal
LA English
AB Ternary single-source precursors were used to deposit CuInS₂ thin films using chemical spray pyrolysis. The authors studied the effect of the film composition on texture, secondary phase formation, and grain size. Films with either (112)- or (204/220)-preferred orientation were deposited with most often In-rich composition. The (112)-preferred orientation became more pronounced as the film composition became more In-poor. Films with a (204/220)-preferred orientation were both In-rich and contained a yet unidentified secondary phase. The phase was evaluated as an In-rich compound based on composition anal. and Raman spectroscopy. Further the phase could be removed by depositing a thin Cu layer prior to the growth of CuInS₂. Similarly, as-grown Cu-rich (112)-oriented films did not exhibit the In-rich compound. The (204/220) preferred orientation of the film is likely related to the equivalent symmetry between planes of CuInS₂ and the In-rich compound. The largest grain size (.apprx. 0.5 μm) was achieved with Cu-rich (112)-oriented films.

RE.CNT 20 THERE ARE 20 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 6 OF 28 CAPLUS COPYRIGHT 2004 ACS on STN
AN 2003:491570 CAPLUS
DN 139:189925
TI Nanocrystalline Chalcopyrite Materials (CuInS₂ and CuInSe₂) via Low-Temperature Pyrolysis of Molecular Single-Source Precursors
AU Castro, Stephanie L.; Bailey, Sheila G.; Raffaele, Ryne P.; Banger, Kulbinder K.; Hepp, Aloysius F.
CS Ohio Aerospace Institute, Cleveland, OH, 44142, USA
SO Chemistry of Materials (2003), 15(16), 3142-3147
CODEN: CMATEX; ISSN: 0897-4756
PB American Chemical Society
DT Journal
LA English
AB Nanometer-sized particles of the chalcopyrite compds. CuInS₂ and CuInSe₂ were synthesized by thermal decomposition of mol. single-source precursors (PPh₃)₂CuIn(SeT)₄ and (PPh₃)₂CuIn(SePh)₄, resp., in the noncoordinating solvent dioctyl phthalate at 200-300°. The nanoparticles range in size from 3 to 30 nm and are aggregated to form roughly spherical clusters of .apprx. 500 nm in diameter. X-ray diffraction of the nanoparticle powders shows greatly broadened lines, indicative of very small particle sizes, which is confirmed by TEM. Peaks present in the XRD can be indexed to reference patterns for the resp. chalcopyrite compds. Optical spectroscopy and elemental anal. by energy dispersive spectroscopy support the

identification of the nanoparticles as chalcopyrites.

RE.CNT 58 THERE ARE 58 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 7 OF 28 CAPLUS COPYRIGHT 2004 ACS on STN
AN 2003:428255 CAPLUS
DN 139:294436
TI Single source precursors for fabrication of I-III-VI₂ thin-film solar cells via spray CVD
AU Hollingsworth, J. A.; Banger, K. K.; Jin, M. H.-C.; Harris, J. D.; Cowen, J. E.; Bohannon, E. W.; Switzer, J. A.; Buhro, W. E.; Hepp, A. F.
CS Department of Chemistry, Washington University, St. Louis, MO, 63130, USA
SO Thin Solid Films (2003), 431-432, 63-67
CODEN: THSFAP; ISSN: 0040-6090
PB Elsevier Science B.V.
DT Journal
LA English
AB The development of thin-film solar cells on flexible, lightwt., space-qualified substrates provides an attractive cost solution to fabricating solar arrays with high sp. power (W/kg). Thin-film fabrication studies demonstrate that ternary single source precursors can be used in either a hot or cold-wall spray chemical vapor deposition (CVD) reactor for depositing CuInS₂, CuGaS₂, and Cu(Ga,In)S₂ at reduced temps. (400-450°), which display good elec. and optical properties suitable for photovoltaic devices. X-ray diffraction studies, energy dispersive spectroscopy, and SEM confirmed the formation of the single-phase CuInS₂, CuGaS₂, and Cu(Ga,In)S₂ thin films on various substrates at reduced temps.

RE.CNT 22 THERE ARE 22 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 8 OF 28 CAPLUS COPYRIGHT 2004 ACS on STN
AN 2003:383457 CAPLUS
DN 139:309891
TI A review of single source precursors for the deposition of ternary chalcopyrite materials
AU Banger, K. K.; Cowen, J.; Harris, J.; McClarnon, R.; Hehemann, D. G.; Duraj, S. A.; Scheiman, D.; Hepp, A. F.
CS Ohio Aerospace Institute, Brookpark, OH, 44142, USA
SO NASA Conference Publication (2002), 2002-211831(17th Space Photovoltaic Research and Technology Conference, 2001), 115-125
CODEN: NACPDJ; ISSN: 0191-7811
PB National Aeronautics and Space Administration
DT Journal; (computer optical disk)
LA English
AB The development of thin-film solar cells on flexible, lightwt., space-qualified durable substrates (i.e. Kapton) provides an attractive solution to fabricating solar arrays with high sp. power. The syntheses and thermal modulation of ternary single source precursors, based on the [({LR})₂Cu(SR')₂In(SR')₂]-architecture, in good yields, are described. TGA and low-temperature DSC demonstrate that controlled manipulation of the steric and electronic properties of either the group 5-donor and/or chalcogenide moiety permits directed adjustment of the thermal stability and phys. properties of the precursors. TGA-Evolved Gas Anal., confirms that single precursors decompose by the initial expulsion of the sulfide moiety, followed by the loss of the neutral donor group, (L) to release the ternary chalcopyrite matrix. XRD studies, EDS and SEM of the nonvolatile pyrolyzed material demonstrate that these derivs. produce single-phase CuInS₂/CuInSe₂ materials at low temperature Thin-film fabrication studies demonstrate that these single source precursors can be used in a spray CVD process to deposit CuInS₂ onto flexible polymer substrates at temps. <400°.

RE.CNT 31 THERE ARE 31 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 9 OF 28 CAPLUS COPYRIGHT 2004 ACS on STN
AN 2003:383454 CAPLUS
DN 139:152228
TI Atmospheric pressure spray chemical vapor deposited CuInS₂ thin films for photovoltaic applications
AU Harris, J. D.; Raffaele, R. P.; Banger, K. K.; Smith, M. A.; Scheiman, D. A.; Hepp, A. F.
CS Cleveland State University, Cleveland, OH, 44115, USA
SO NASA Conference Publication (2002), 2002-211831(17th Space Photovoltaic Research and Technology Conference, 2001), 84-90
 CODEN: NACPDJ; ISSN: 0191-7811
PB National Aeronautics and Space Administration
DT Journal; (computer optical disk)
LA English
AB Solar cells have been prepared using atmospheric pressure spray chemical vapor deposited CuInS₂ absorbers. The CuInS₂ films were deposited at 390° using single source precursor (PPh₃)₂CuIn(SEt)₄ in an argon atmosphere. The absorber ranges in thickness from 0.75 to 1.0 µm, and exhibits a crystallog. gradient, with the leading edge having a (220) preferred orientation and the trailing edge having a (112) orientation. Schottky diodes prepared by thermal evaporation of aluminum contacts on to the CuInS₂ yielded diodes for films that were annealed at 600°. Solar cells were prepared using annealed films and had the (top-to-down) composition of Al/ZnO/CdS/CuInS₂/Mo/glass. The short-circuit current, open-circuit voltage, fill factor, and efficiency were 6.46 mA/cm², 307 mV, 24%, and 0.35%, resp., for the best small area cells under simulated air-mass 0 illumination.

RE.CNT 16 THERE ARE 16 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 10 OF 28 CAPLUS COPYRIGHT 2004 ACS on STN
AN 2003:365416 CAPLUS
DN 139:94254
TI Novel Bimetallic Thiocarboxylate Compounds as Single-Source Precursors to Binary and Ternary Metal Sulfide Materials
AU Deivaraj, Theivanayagam C.; Park, Jin-Ho; Afzaal, Mohammad; O'Brien, Paul; Vittal, Jagadeesha J.
CS Department of Chemistry, National University of Singapore, Singapore, 117543, Singapore
SO Chemistry of Materials (2003), 15(12), 2383-2391
 CODEN: CMATEX; ISSN: 0897-4756
PB American Chemical Society
DT Journal
LA English
OS CASREACT 139:94254
AB Binuclear [(Ph₃P)CuM(SC(O)Ph)₄] (M = Ga (1) or In (2)), [(Ph₃P)₂AgGa(SC(O)Ph)₄] (3), [(Ph₃P)₂AgIn(SC(O)R)₄] (R = Me (4) or Ph (5)) were synthesized and characterized. The solid-state structures of compds. 1-3 were determined by x-ray crystallog. TG and pyrolysis studies revealed that these compds. decompose to give the corresponding ternary metal sulfide materials. However, using the aerosol-assisted CVD (AACVD) method, In₂S₃ thin films were obtained from 2 and AgIn₅S₈ thin films were obtained from compds. 4 and 5.

RE.CNT 47 THERE ARE 47 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 11 OF 28 CAPLUS COPYRIGHT 2004 ACS on STN
AN 2003:315506 CAPLUS

DN 139:119828
TI Characterization of CuInS₂ films prepared by atmospheric pressure spray chemical vapor deposition
AU Harris, Jerry D.; Banger, Kulbinder K.; Scheiman, David A.; Smith, Mark A.; Jin, Michael H.-C.; Hepp, Aloysius F.
CS Department of Chemistry, Cleveland State University, Cleveland, OH, 44115, USA
SO Materials Science & Engineering; B: Solid-State Materials for Advanced Technology (2003), B98(2), 150-155
CODEN: MSBTEK; ISSN: 0921-5107
PB Elsevier Science B.V.
DT Journal
LA English
AB CuInS₂ films were deposited by atmospheric pressure spray CVD. Films were deposited at 390° using [(PPh₃)₂CuIn(SEt)₄] as a single source precursor in an Ar atmospheric. The films range in thickness from 0.75 to 1.0 μm and exhibit a crystallog. gradient, with the leading edge having a (220) preferred orientation and the trailing edge having a (112) orientation. Schottky diodes prepared by thermal evaporation of Al contacts onto the CuInS₂ yielded diodes for films that were annealed at 600°. The photoresponse of several films was measured by photoelectrochem. anal. in an aqueous, acidic electrolyte. Prolonged exposure of the films to the electrolyte decreased the photoresponse. Complete solar cells were prepared using annealed films with a (top down) composition of Al/ZnO/CdS/CuInS₂/Mo/Glass. The values for the short-circuit current, open-circuit voltage, maximum power output (P_{max}), current at P_{max} (I_{max}), voltage at P_{max} (V_{max}), fill factor and efficiency were 5.25 mA, 304 mV, 0.470 mW, 2.92 mA, 161 mV, 29.4 and 0.68%, resp., for a 0.5 cm² cell under simulated AM0 illumination.

RE.CNT 30 THERE ARE 30 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 12 OF 28 CAPLUS COPYRIGHT 2004 ACS on STN
AN 2003:243913 CAPLUS
DN 139:94219
TI Synthesis, characterization, and spectroscopic properties of heterobimetallic isopropoxides of Co, Ni and Cu containing diethanolaminate moiety
AU Sharma, Kanupriya; Sharma, Malti; Singh, Anirudh; Mehrotra, Ram C.
CS Department of Chemistry, University of Rajasthan, Jaipur, 302 004, India
SO Indian Journal of Chemistry, Section A: Inorganic, Bio-inorganic, Physical, Theoretical & Analytical Chemistry (2003), 42A(3), 493-498
CODEN: ICACEC; ISSN: 0376-4710
PB National Institute of Science Communication
DT Journal
LA English
OS CASREACT 139:94219
AB Hydrocarbon-insol. derivs. M(deaH)₂ (M = Co, Ni, Cu; deaH₂ = diethanolamine) on reactions with Al(OPri)₃ in 1:2 molar ratio yield hydrocarbon-soluble, monomeric heterobimetallic derivs. [{Al(OPri)₂})₂M(dea)₂}. A different type of soluble heteroleptic derivs. was prepared by the reactions of M{Al(OPri)₄})₂ with deaH₂ in 1:1, 1:2 and 1:3 molar ratios. The reaction of M{Al(OPri)₄})₂ with four equivalent of diethanolamine yields a benzene insol. product M{Al(dea)₂})₂. All these new derivs. were characterized by elemental analyses, mol. weight measurements and spectroscopic (Electronic and IR) studies.

RE.CNT 14 THERE ARE 14 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 13 OF 28 CAPLUS COPYRIGHT 2004 ACS on STN
AN 2002:974910 CAPLUS

DN 138:306675
 TI Single-source approach for the growth of I-III-VI thin films
 AU Afzaal, Mohammad; Deivaraj, Theivanayagam C.; O'Brien, Paul; Park, Jin-Ho; Vittal, Jagadeesha J.
 CS The Manchester Materials Science Centre and Department of Chemistry, University of Manchester, Manchester, M13 9PL, UK
 SO Materials Research Society Symposium Proceedings (2002), 730 (Materials for Energy Storage, Generation and Transport), 185-190
 CODEN: MRSPDH; ISSN: 0272-9172
 PB Materials Research Society
 DT Journal
 LA English
 AB The ternary chalcopyrite semiconductors, I-III-VI, are currently used for photovoltaic solar cell applications. AgIn5S8 thin films were prepared from single-source bimetalorg. precursors [e.g. (PPh3)2AgIn(SC(O)R)4, R = alkyl] by aerosol assisted CVD (AA-CVD). These compds. can be used as single-source precursors for the deposition of the ternary chalcopyrite semiconductors by one-pot reactions using the AA-CVD process. In addition, these compds. are air stable, which is favorable in comparison with metal alkyl compds. which are pyrophoric. The optimum growth temperature for the preparation of these films on glass and on Si(100) substrates is >350° in terms of crystallinity, although deposition occurred at low temps. The films were studied using XRD, SEM and EDS. SEM anal. shows that all films are microcryst. but have different morphologies depending on the growth temps. XRD results show evidence of the crystalline nature of these films. Results are presented and discussed.

RE.CNT 15 THERE ARE 15 CITED REFERENCES AVAILABLE FOR THIS RECORD
 ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 14 OF 28 CAPLUS COPYRIGHT 2004 ACS on STN
 AN 2002:378096 CAPLUS
 DN 137:102977
 TI Extending the Coordination Chemistry of Molecular P4S3: The Polymeric Ag(P4S3)+ and Ag(P4S3)2+ Cations
 AU Adolf, Ariane; Gonsior, Marcin; Krossing, Ingo
 CS Institut fuer Anorganische Chemie, Universitaet Karlsruhe, Karlsruhe, D-76128, Germany
 SO Journal of the American Chemical Society (2002), 124(24), 7111-7116
 CODEN: JACSAT; ISSN: 0002-7863
 PB American Chemical Society
 DT Journal
 LA English
 AB Upon reacting P4S3 with AgAl(hfip)4 and AgAl(pftb)4 [hfip = OC(H)(CF3)2; pftb = OC(CF3)3], the compds. Ag(P4S3)Al(hfip)4 (1) and Ag(P4S3)2+[Al(pftb)4]- (2) formed in CS2 or CS2/CH2Cl2 solution, resp. Compds. 1 and 2 were characterized by single-crystal x-ray structure detns., Raman and solution NMR spectroscopy, and elemental analyses. One-dimensional chains of [Ag(P4S3)x]∞ (x = 1 (1); x = 2 (2)) formed in the solid state with P4S3 ligands that bridge through a 1,3-P,S, a 2,4-P,S, or a 3,4-P,P n1 coordination to the silver ions. Compound 2 with the least basic anion contains the 1st homoleptic metal(P4S3) complex. Compds. 1 and 2 also include the long sought sulfur coordination of P4S3. Raman spectra of 1 and 2 were assigned from DFT calcns. of related species. The influence of the silver coordination on the geometry of the P4S3 cage is discussed, addnl. aided by DFT calcns. Consequences for the frequently observed degradation of the cage are suggested. An exptl. silver ion affinity scale based on the solid-state structures of several weak Lewis acid base adducts (L)AgAl(hfip)4 is given. The affinity of the ligand L to the silver ion increases according to P4 < CH2Cl2 < P4S3 < S8 < 1,2-C2H4Cl2 < toluene.

RE.CNT 59 THERE ARE 59 CITED REFERENCES AVAILABLE FOR THIS RECORD
 ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 15 OF 28 CAPLUS COPYRIGHT 2004 ACS on STN
 AN 2002:140318 CAPLUS
 DN 136:349702
 TI Superweak complexes of tetrahedral P4 molecules with the silver cation of weakly coordinating anions
 AU Krossing, Ingo; Van Wullen, Leo
 CS Institut für Anorganische Chemie, Universität Karlsruhe, Karlsruhe, 76128, Germany
 SO Chemistry--A European Journal (2002), 8(3), 700-711
 CODEN: CEUJED; ISSN: 0947-6539
 PB Wiley-VCH Verlag GmbH
 DT Journal
 LA English
 OS CASREACT 136:349702
 AB The silver aluminates $\text{AgAl}[\text{OC}(\text{CF}_3)_2(\text{R})]_4$ ($\text{R} = \text{H}, \text{CH}_3, \text{CF}_3$) react with solns. of white phosphorus P4 to give complexes that bind one or two almost undistorted tetrahedral P4 mols. in an η^2 fashion: $[\text{Ag}(\text{P}_4)_2] + [\text{Al}(\text{OC}(\text{CF}_3)_3)_4]^-$ (1) containing the 1st homoleptic metal-phosphorus cation, the mol. species $(\text{P}_4)\text{AgAl}[\text{OCMe}(\text{CF}_3)_2]_4$ (2), and the dimeric $\text{Ag}(\mu, \eta^2\text{-P}_4)\text{Ag}$ bridged $\{(\text{P}_4)\text{AgAl}[\text{OC}(\text{H})(\text{CF}_3)_2]_4\}_2$ (3). Compds. 1-3 were characterized by variable-temperature (VT) ^{31}P NMR spectroscopy (1 also by VT ^{31}P MAS NMR spectroscopy), Raman spectroscopy, and single-crystal x-ray crystallog. Other Ag:P4 ratios did not lead to new species, and this observation was rationalized on thermodyn. grounds. The $\text{Ag}(\text{P}_4)_2^+$ ion has an almost planar coordination environment around the Ag^+ ion due to $\text{dx}^2\text{-y}^2(\text{Ag}) \rightarrow \sigma^*(\text{P-P})$ backbonding. Calcns. (HF-DFT) on six $\text{Ag}(\text{P}_4)_2^+$ isomers showed that the planar η^2 form is only slightly favored by 5.2 kJ mol $^{-1}$ over the tetrahedral η^2 species; $\eta^1\text{-P}_4$ and $\eta^3\text{-P}_4$ complexes are less favorable (27-76 kJ mol $^{-1}$). The bonding of the P4 moiety in $[\text{RhCl}(\eta^2\text{-P}_4)(\text{PPh}_3)_2]$, the only compound in which an η^2 bonding mode of a tetrahedral P4 mol. was claimed, must be regarded as a tetraphosphabicyclobutane, and not as a tetrahedro-P4 complex, from the published NMR and vibrational spectra, the calculated geometry of $[\text{RhCl}(\text{P}_4)(\text{PH}_3)_2]$ (10), the highly endothermic (385 kJ mol $^{-1}$) calculated dissociation enthalpy of 10 into P4 and $\text{RhCl}(\text{PH}_3)_2$ (11), as well as atoms in mols. (AIM) and natural bond orbital (NBO) population analyses of 10 and the $\text{Ag}(\text{P}_4)_2^+$ ion. Therefore, 1-3 are the 1st examples of species containing η^2 -coordinated tetrahedral P4 mols.
 RE.CNT 46 THERE ARE 46 CITED REFERENCES AVAILABLE FOR THIS RECORD
 ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 16 OF 28 CAPLUS COPYRIGHT 2004 ACS on STN
 AN 2002:81783 CAPLUS
 DN 137:65628
 TI Facile modulation of single source precursors: the synthesis and characterization of single source precursors for deposition of ternary chalcopyrite materials
 AU Banger, K. K.; Harris, J. D.; Cowen, J. E.; Hepp, A. F.
 CS Thin Film Technology Group, NASA Glenn Research Center, Cleveland, OH, 44135, USA
 SO Thin Solid Films (2002), 403-404, 390-395
 CODEN: THSFAP; ISSN: 0040-6090
 PB Elsevier Science S.A.
 DT Journal
 LA English
 AB The syntheses and controlled thermal decomposition of ternary single-source-precursors for preparation of copper indium disulfide (CuInS_2) thin films was studied, using precursors of structure $(\text{ER}_3)_2\text{Cu}(\text{YR}')_2\text{In}(\text{YR}')_2$ (I; $\text{E} = \text{P}, \text{As}, \text{Sb}$; $\text{Y} = \text{S}, \text{Se}$; and $\text{R} = \text{alkyl}, \text{aryl}$). Good yields of thin-film CuInS_2 were obtained for I ($\text{R} = \text{Bu}$, $\text{Y} = \text{S}$; and $\text{R}' = \text{Et}$ or Pr) on flexible polymeric substrates at $<400^\circ$. These new

comps. were decomposed by spray chemical vapor deposition to CuInS₂, an absorber layer for the fabrication of thin-film solar cells. Thermogravimetric analyses (TGA) and differential scanning calorimetry demonstrated that controlled manipulation of the steric and electronic properties of either the Group V donor and/or chalcogenide moiety resulted in a directed adjustment of the thermal stability and phys. properties of the precursor. Preliminary studies showed that these comps. produced single-phase CuInS₂ thin films at low temperature, which was confirmed by x-ray diffraction, energy dispersive spectrometry, and SEM.

RE.CNT 12 THERE ARE 12 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 17 OF 28 CAPLUS COPYRIGHT 2004 ACS on STN

AN 2001:826008 CAPLUS

DN 136:193190

TI Single-source precursors to ternary silver indium sulfide materials

AU Deivaraj, Theivanayagam C.; Park, Jin-Ho; Afzaal, Mohammed; O'Brien, Paul; Vittal, Jagadese J.

CS Department of Chemistry, National University of, Singapore

SO Chemical Communications (Cambridge, United Kingdom) (2001), (22), 2304-2305

CODEN: CHCOFS; ISSN: 1359-7345

PB Royal Society of Chemistry

DT Journal

LA English

OS CASREACT 136:193190

AB [(Ph₃P)₂AgIn(SC(O)R)₄] (R = Me, Ph) were prepared, characterized, and used as excellent single-source precursors for AgInS₂ bulk materials by pyrolysis and AgIn₅S₈ films by aerosol assisted CVD (AACVD). Crystals of the chloroform solvate of the Ph complex are triclinic, space group P.hivin.1, with a 12.7284(5), b 14.3145(6), c 18.7071(7) Å, α 90.716(1), β 99.624(1), γ 110.728(1)°; Z = 2, dc = 1.500; R = 0.0486, Rw = 0.0802.

RE.CNT 15 THERE ARE 15 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 18 OF 28 CAPLUS COPYRIGHT 2004 ACS on STN

AN 2001:792600 CAPLUS

DN 136:95012

TI Synthesis and Characterization of the First Liquid Single-Source Precursors for the Deposition of Ternary Chalcopyrite (CuInS₂) Thin Film Materials

AU Banger, Kulbinder K.; Cowen, Jonathan; Hepp, Aloysius F.

CS Ohio Aerospace Institute, Cleveland, OH, 44142, USA

SO Chemistry of Materials (2001), 13(11), 3827-3829

CODEN: CMATEX; ISSN: 0897-4756

PB American Chemical Society

DT Journal

LA English

OS CASREACT 136:95012

AB Mol. engineering of ternary single-source precursors based on the [(Pbu₃)₂Cu(SR)₂In(SR)₂] architecture have afforded the first liquid CIS ternary single-source precursors (when R = Et, n-Pr), which are suitable for low-temperature deposition (<350°). Thermogravimetric analyses (TGA) and modulated DSC confirm their liquid phase and reduced stability. X-ray diffraction studies, EDS, and SEM support the formation of the single-phase chalcopyrite CuInS₂ at low temps.

RE.CNT 22 THERE ARE 22 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 19 OF 28 CAPLUS COPYRIGHT 2004 ACS on STN

AN 2001:381747 CAPLUS

DN 135:155059
TI Using single source precursors and spray chemical vapor deposition to grow thin-film CuInS₂
AU Harris, Jerry D.; Hehemann, David G.; Cowen, Jonathan E.; Hepp, Aloysius F.; Raffaelle, Ryne P.; Hollingsworth, Jennifer A.
CS School of Technology, Kent State University, Kent, OH, 44242, USA
SO Conference Record of the IEEE Photovoltaic Specialists Conference (2000), 28th, 563-566
CODEN: CRCNDP; ISSN: 0160-8371
PB Institute of Electrical and Electronics Engineers
DT Journal
LA English
AB Thin films of CuInS₂ were deposited on fused silica, stainless steel, Kapton and polybenzobisoxazole using the single source organometallic precursor (PPh₃)₂CuIn(SEt)₄, in conjunction with spray chemical vapor deposition. Films were deposited at temps. ranging from 325 - 360°C. As deposited, the films had a thickness on the order of 200 Å. The grain structure of the films was found to vary with carrier gas flow rate and substrate temperature
RE.CNT 9 THERE ARE 9 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 20 OF 28 CAPLUS COPYRIGHT 2004 ACS on STN
AN 1999:407704 CAPLUS
DN 131:80925
TI Spray CVD of copper indium disulfide films. Control of microstructure and crystallographic orientation
AU Hollingsworth, Jennifer A.; Hepp, Aloysius F.; Buhro, William E.
CS Dep. Chem., Washington Univ., St. Louis, MO, 63130, USA
SO Chemical Vapor Deposition (1999), 5(3), 105-108 Published in: Adv. Mater. (Weinheim, Ger.), 11(8)
CODEN: CVDEFX; ISSN: 0948-1907
PB Wiley-VCH Verlag GmbH
DT Journal
LA English
AB The deposition of dense crystalline CuInS₂ films by spray CVD from a single source precursor was investigated. Toluene solns. of the precursor (Ph₃P)₂-Cu(μ-SEt₂)In(SEt)₂ were employed and depositions were conducted using a warm-zone temperature of 140 ± 10° at substrate temps. of 405 ± 5° with Ar carrier-gas flow rates of 2.7-5.3 L/min. Wavelength-dispersive x-ray spectroscopy showed that the films were nearly stoichiometric CuInS₂. X-ray diffraction pattern confirmed the crystalline state of the CuInS₂ films. Film microstructure and orientations were studied in function of the deposition parameters such as substrate (fused SiO₂, Si(100) substrate, or In₂O₃ buffer layers) and carrier gas flow rate. Films deposited on fused SiO₂ or Si(100) substrates exhibited the uncommon [220] orientation whereby the degree of orientation depended on the carrier-gas flow rate. Films deposited on In₂O₃ buffer layers were highly [112]-oriented. Carrier-gas flow significantly influenced the film microstructure. Films deposited at the lowest flow rate exhibited dendritic microstructures and were visually rough and black, whereas films deposited at the highest flow rates were visually the most uniform and reflective, and were blue with a microstructure consisting of non-faceted, elongated grains. Films deposited at intermediate flow rate exhibited dense, columnar growth and faceted crystalline features.
RE.CNT 20 THERE ARE 20 CITED REFERENCES AVAILABLE FOR THIS RECORD
ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 21 OF 28 CAPLUS COPYRIGHT 2004 ACS on STN
AN 1998:536748 CAPLUS
DN 129:252601
TI Spray chemical vapor deposition of CuInS₂ thin films for application in

solar cell devices

AU Hollingsworth, Jennifer A.; Buhro, William E.; Hepp, Aloysius F.; Jenkins, Philip P.; Stan, Mark A.

CS Dept. of Chemistry, Washington University, St. Louis, MO, 63130, USA

SO Materials Research Society Symposium Proceedings (1998), 495 (Chemical Aspects of Electronic Ceramics Processing), 171-176

CODEN: MRSPDH; ISSN: 0272-9172

PB Materials Research Society

DT Journal

LA English

AB Chalcopyrite CuInS₂ is a direct band gap semiconductor (1.5 eV) that has potential applications in photovoltaic thin film and photoelectrochem. devices. The authors have successfully employed spray CVD using the previously known, single-source, metalorg. precursor, (Ph₃P)₂CuIn(SET)₄, to deposit CuInS₂ thin films. Stoichiometric, polycryst. films were deposited onto fused SiO₂ over a range of temps. (300-400°). Morphol. was observed to vary with temperature: spheroidal features were obtained at lower temps. and angular features at 400°. At even higher temps. (500°), a Cu-deficient phase, CuIn₅S₈, was obtained as a single phase. The CuInS₂ films have a direct band gap of .apprx.1.4 eV.

RE.CNT 13 THERE ARE 13 CITED REFERENCES AVAILABLE FOR THIS RECORD

ALL CITATIONS AVAILABLE IN THE RE FORMAT

L4 ANSWER 22 OF 28 CAPLUS COPYRIGHT 2004 ACS on STN

AN 1993:159854 CAPLUS

DN 118:159854

TI Synthesis of mixed copper-indium chalcogenolates. Single-source precursors for the photovoltaic materials CuInQ₂ (Q = S, Se)

AU Hirpo, Wakgari; Dhingra, Sandeep; Sutorik, Anthony C.; Kanatzidis, Mercouri G.

CS Dep. Chem., Michigan State Univ., East Lansing, MI, 48824, USA

SO Journal of the American Chemical Society (1993), 115(4), 1597-9

CODEN: JACSAT; ISSN: 0002-7863

DT Journal

LA English

AB The mol. precursor compds. (Ph₃P)₂CuIn(QR)₄ (1; Q = S, R = Et; Q = Se, R = Et; Q = S, R = isobutyl) for the ternary semiconductor photovoltaic materials CuInQ₂ (Q = S, Se) were prepared. Mol. structures of 1 show heterobimetallic compds. with 2 thiolates/selenolates bridging Cu and In atoms forming a CuIn(QR)₂ core. The tetrahedral Cu and In coordination spheres are completed by terminal R₃P and QR- ligands, resp. Crystal data for 1: space group C2/c, R/Rw = 0.037/0.043; P.hivin.1, R/Rw = 0.038/0.031; P.hivin.1, R = 0.12, resp. Vacuum thermolysis of (Ph₃P)₂CuIn(QR)₄ at 400° gives single phase crystalline CuInQ₂.

L4 ANSWER 23 OF 28 CAPLUS COPYRIGHT 2004 ACS on STN

AN 1991:74060 CAPLUS

DN 114:74060

TI Synthesis, reactions and characterization of bi- and ter-metallic alkoxides of copper(II) with aluminum(III), zirconium(IV), niobium(V) and tantalum(V)

AU Chhipa, R. C.; Singh, A.; Mehrotra, R. C.

CS Dep. Chem., Univ. Rajasthan, Jaipur, 302004, India

SO Synthesis and Reactivity in Inorganic and Metal-Organic Chemistry (1990), 20(8), 989-99

CODEN: SRIMCN; ISSN: 0094-5714

DT Journal

LA English

AB [(Me₃CO)₄Al]Cu[M(OCHMe₂)_x] (M = Al, x = 4; M = Nb or Ta, x = 6), [(Me₃O)₄Al]Cu[Zr₂(OCHMe₂)₉], [(Me₂CHO)₄Al]Cu[Ta(OCHMe₂)₆] (I) and [(Me₂CHO)₆Nb]Cu[Ta(OCHMe₂)₆] (II) were synthesized by the equimolar

interaction of the appropriate chlorobimetallic alkoxide of Cu(II) with a suitable potassium alkoxometallate. Methanolysis of II produced $[(\text{MeO})_6\text{Nb}]\text{Cu}[\text{Ta}(\text{OMe})_6]$. The alcoholysis reactions of I with PrOH , MeOH , or Me_3COH gave rise to $[(\text{RO})_4\text{Al}]\text{Cu}[\text{Ta}(\text{OR})_6]$ ($\text{R} = \text{Pr}, \text{Me}$), $[\text{AlCuTa}(\text{OMe})_6(\text{OCHMe}_2)_4]$, or $[(\text{Me}_3\text{CO})_3(\text{Me}_2\text{CHO})\text{Al}]\text{Cu}[\text{Ta}(\text{OCHMe}_2)_2(\text{OCMe}_3)_4]$. All these new derivs. were characterized by elemental analyses, IR, electronic spectral studies, and mol. weight as well as magnetic susceptibility measurements.

L4 ANSWER 24 OF 28 CAPLUS COPYRIGHT 2004 ACS on STN

AN 1990:110706 CAPLUS

DN 112:110706

TI New chloro, alkoxo and allied bimetallic derivatives of copper(II) and aluminum(III)

AU Chhipa, R. C.; Singh, A.; Mehrotra, R. C.

CS Dep. Chem., Univ. Rajasthan, Jaipur, 302 004, India

SO Indian Journal of Chemistry, Section A: Inorganic, Physical, Theoretical & Analytical (1989), 28A(5), 396-9

CODEN: IJCADU; ISSN: 0376-4710

DT Journal

LA English

AB $\text{ClCu}\{\text{Al}(\text{OCHMe}_2)_4\}$ was prepared by the interaction of CuCl_2 and $\text{K}\{\text{Al}(\text{OCHMe}_2)_4\}$ in equimolar proportions. $((\text{Me}_2\text{CHO})\text{Cu}\{\text{Al}(\text{CHMe}_2)_4\})$ (I) was prepared by the reaction of CuCl_2 , KOCHMe_2 and $\text{K}\{\text{Al}(\text{OCHMe}_2)_4\}$ in 1:1:1 molar ratio. The interaction of chloro bimetallic alkoxides with KOR gives $(\text{RO})\text{Cu}\{\text{Al}(\text{OCHMe}_2)_4\}$. I undergoes alc. interchange reactions, the facile nature of which is governed by the length and branching of the hydrocarbon chains of alcs. e.g. MeOH , EtOH , PrOH , sec-BuOH , tert-BuOH . The reaction with iso-BuOH gives only the mixed bimetallic alkoxides. The products were characterized by elemental analyses, mol. wts., IR, electronic spectral and magnetic susceptibility measurements.

L4 ANSWER 25 OF 28 CAPLUS COPYRIGHT 2004 ACS on STN

AN 1988:230854 CAPLUS

DN 108:230854

TI Chloride and alkoxide alkoxometallates and termetallic isopropoxides of copper(II)

AU Dubey, Raj K.; Singh, Anirudh; Mehrotra, Ram C.

CS Dep. Chem., Univ. Rajasthan, Jaipur, 302004, India

SO Journal of Organometallic Chemistry (1988), 341(1-3), 569-74

CODEN: JORCAI; ISSN: 0022-328X

DT Journal

LA English

AB $[\text{CuClL}]$ [$\text{L} = \text{Zr}_2(\text{OCHMe}_2)_9$, $\text{Ta}(\text{OCHMe}_2)_6$] were prepared and characterized by IR spectra, and are key precursors in the preparation of $[\text{CuLL}_1]$ [$\text{HL}_1 = \text{MeOH}$, Me_2CHOH , BuOH , EtMeCHOH , Me_3COH] and $[\text{CuL}\{\text{Zr}_2(\text{OCHMe}_2)_9\}]$ [$\text{HL} = \text{HAL}(\text{OCHMe}_2)_4$, $\text{HGa}(\text{OCHMe}_2)_4$, $\text{HTa}(\text{OCHMe}_2)_6$].

L4 ANSWER 26 OF 28 CAPLUS COPYRIGHT 2004 ACS on STN

AN 1981:609778 CAPLUS

DN 95:209778

TI Electronic structure of simple and bimetallic alkoxides of later '3d' transition elements

AU Mehrotra, R. C.

CS Chem. Lab., Univ. Rajasthan, Jaipur, India

SO Coordination Chemistry (1981), Volume Date 1980, 21, 113-25

CODEN: CCHEDK; ISSN: 0069-9845

DT Journal

LA English

AB The alkoxy group (-OR) functions as a bridging ligand between similar and different metal atoms giving rise to coordination oligomers and bimetallic alkoxides. The syntheses of a large number of simple alkoxides of Cr(III) &

IV), Mn(II), Fe(II & III), Co(II), Ni(II) and Cu(II) were described. Most of these are non-volatile and insol. in organic solvents, except (t-BuO)₄C and alkoxides or Fe(III), Fe(OR)₃, in general. These polymeric new alkoxides of later '3d' metals differ from the alkoxides of earlier transition and main group elements in the comparatively much lesser lability of their alkoxy groups in general. The sharp differences in the alcoholysis reactions of these alkoxides with ramification of the alkyl group were correlated with the changes in the stereochem. of the alkoxide derivs. as revealed by physico-chemical studies. A large number of monomeric volatile bimetallic isopropoxides of the above elements with Al, having the general formula M[Al(Oi-Pr)₄]_n were described for the 1st time. Structures of all these derivs. were suggested on the basis of spectroscopic (visible, UV, IR and ESR) and magneto-chemical studies, with tetraalkoxy aluminate moieties functioning as univalent bidentate and in some cases as tridentate ligands.

L4 ANSWER 27 OF 28 CAPLUS COPYRIGHT 2004 ACS on STN
 AN 1979:412926 CAPLUS
 DN 91:12926
 TI Volatile double isopropoxides of later transition metals with aluminum
 AU Singh, J. V.; Jain, N. C.; Mehrotra, R. C.
 CS Chem. Lab., Univ. Delhi, Delhi, 110007, India
 SO Synthesis and Reactivity in Inorganic and Metal-Organic Chemistry (1979),
 9(1), 79-88
 CODEN: SRIMCN; ISSN: 0094-5714
 DT Journal
 LA English
 AB The liquid monomeric complexes M[Al(OPr-iso)₄]_n (M = Cr, Fe, n = 3; M = Co,
 Cu, Mn, Ni, n = 2) were prepared and characterized by chemical anal.,
 mol.-weight
 detns., solubility in organic solvents, and IR spectra. The [Al(OPr-iso)₄]-
 ion
 acts as a bidentate ligand in these complexes.

L4 ANSWER 28 OF 28 CAPLUS COPYRIGHT 2004 ACS on STN
 AN 1979:161457 CAPLUS
 DN 90:161457
 TI Ligand field spectroscopic studies of transition metal-aluminum
 tetraalkoxides
 AU Stumpp, Eberhard; Hillebrand, Uwe
 CS Anorg.-Chem. Inst., Tech. Univ. Clausthal, Clausthal-Zellerfeld, Fed. Rep.
 Ger.
 SO Zeitschrift fuer Naturforschung, Teil B: Anorganische Chemie, Organische
 Chemie (1979), 34B(2), 262-5
 CODEN: ZNBAD2; ISSN: 0340-5087
 DT Journal
 LA German
 AB The preparation and electronic spectral properties of M[Al(OR)₄]₂ (M = Co, Ni,
 Cu; R = Me, Et, Pr, Bu) are described. The spectral data are used in
 conjunction with ligand-field theory in deducing the structures of the
 compds. The spectrum of green Ni[Al(OR)₄]₂ is interpreted as a Ni(OR)₆
 octahedron sharing faces with 2 Al(OR)₄ tetrahedrons. Co²⁺ and Cu²⁺ are
 in a distorted octahedral coordination. The alkoxide ligands are fitted
 into the spectrochem. and the nephelauxetic series. They are close to H₂O
 in these series.